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Prevalence of causative organisms in corneal ulcers seen at Sekuru Kaguvi Eye Unit, Harare, Zimbabwe

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Abstract

Objective: To investigate the prevalence of organisms causing corneal ulcers, determine frequency of ocular risk factors and assess the value of Gram stain in initial identification of pathogens.

Design: A descriptive cross sectional study.

Setting: Sekuru Kaguvi Eye Unit at Parirenyatwa Group of Hospitals in Harare, Zimbabwe.

Materials and Methods: We enrolled 43 patients with corneal ulcers for the study. Demographic data was obtained, measurement of visual acuity was done by Snellen's chart and a Topcon Slit Lamp was used to determine the characteristics of ulcers for all the patients. Corneal scrapings were obtained and examined by microscopy and culture methods to determine etiologic organisms. Positivity rates between Gram stain and culture methods were compared.

Main Outcome Measures: Prevalence of different bacterial isolates in corneal ulcers, risk factors to infection and laboratory methods used for detection.

Results: Gram-positive *cocci* were the most prevalent organisms found (54%) followed by *E. coli* (18%). *Pseudomonas*, *Klebsiella* and *Narcodia* constituted about 9% each. Trauma, use of traditional eye medicine and previous viral disease were the common risk factors.

Conclusion: Bacteria were the only organisms identified and Gram-positive *cocci* were the most common isolates. Gram stain of corneal smears was not reliable in initial recognition of offending pathogens.

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Introduction

Corneal ulcers result from disruption of the intact epithelial barrier followed by colonization by bacterial, fungal or other viral pathogens. Some bacteria such as *Gonococcus*, *Listeria* species, *Haemophilus* species and *Corynebacterium* can penetrate intact epithelium.¹ The spectrum of micro-organisms that cause corneal ulcers has shown regional and national variations.^{2,3} Some studies^{3,4} found *Staphylococci* as the most prevalent organism, whereas others² found *Pneumococci* as the commonest isolates. In some parts of the tropics, 30 to 50% of corneal ulcers may be caused by fungal infections.^{5,6} The reliability of Gram stain in positively identifying causative organisms before culture results are available has been the subject of controversy. Asbell and Stenson³ showed that up to 88% of organisms identified on smear were confirmed on culture while 66% of negative smears had organisms recovered on

culture. In a study undertaken at an urban African hospital² it was found that organisms were subsequently recovered on culture in 50% of previously negative smears. A study of this kind has not been conducted in Zimbabwe. Hence, we examined the prevalence of causative organisms in corneal ulcers and evaluated the reliability of Gram stain as an initial procedure in laboratory identification of pathogens.

Materials and Methods

Participants.

The study took place at Sekuru Kaguvi Eye Unit of the Parirenyatwa Group of Hospitals in Harare, Zimbabwe, from October 1994 to March 1995. This Eye Unit serves the population of the greater city of Harare and surrounding Mashonaland provinces. It is a teaching hospital and the main research centre in the country. A convenient sampling

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method was used to recruit 43 patients suffering from corneal ulcers during the six months period of the study. Informed consent was obtained from each participant. Both male and female patients, aged not less than 10 years were recruited. This age limit was used, because of difficulty in obtaining corneal material under local anesthesia in children younger than 10 years. Patients with chemical burns, neurotropic ulcers due to *Herpes zoster* or traumatic perforating injuries of eyes were excluded. A designed questionnaire was administered to each patient to obtain demographic information, risk factors for corneal ulceration and presenting symptoms.

Procedures.

In this study, corneal ulcer was defined as an epithelial defect that was visible on Fluorescein staining. Assessment of the ulcer included measurement of visual acuity using Snellen's visual acuity chart at six metres; and biomicroscopic examination of the anterior segment was done with a Topcon Slit lamp (Topcon Corporation Japan). The ulcer's size, its location, extent of corneal reaction and presence of complications such as hypopyon and perforation were recorded. The size of the ulcer was graded as small, medium and large according to the Carmichael *et al.*'s method.²

Corneal scrapings were done in the minor theatre under topical anaesthesia to obtain specimens for microscopy, culture and sensitivity. Magnification was provided by X6 magnifying loop (Keeler Instruments, UK). Multiple areas of the ulcer, including the edges, were scrapped to obtain enough specimens. The procedure was usually done in the presence of a technician who plated the scrapings onto culture plates and made a potassium hydroxide (KOH) wet preparation, stored in a moist chamber for transportation to the laboratory. In the absence of a technician, the scrapings were put in Robertson's cooked meat broth and transported to an outside laboratory for immediate processing. At the end of each procedure, the patient was given a sub-conjunctival injection of Gentamicin 0.5ml and an eye pad was placed on the eye.

In general, initial results of laboratory analysis were available within 12 hours from the private laboratory, and 24 to 36 hours from the hospital laboratory. Herpetic corneal ulcers were diagnosed clinically. The data were analyzed using descriptive statistics and Chi-square.

Results

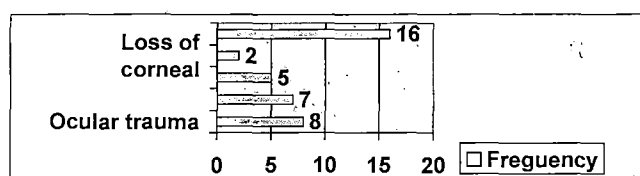
Forty three patients with corneal ulcers who satisfied the inclusion criteria were recruited. Five patients were excluded from the final analysis because of having inadequate data (N=3), non-availability of laboratory results (N=1) and contaminated specimens (N=1). The remaining 38 patients (88.4%) were studied. Out of the 38 patients with corneal ulcers, eight (21.1%) had herpetic and 30 (78.9%) had non-herpetic ulcers. The median age was 33.7 years (range 10 to 95).

Patients in the herpetic group tended to be younger (with a mean age of 28 years) than those in the non-herpetic

group, (mean age 39 to 16.2 years). There were 22 (57.9%) males and 16 (42.1%) females, giving a ratio of 1.4:1. There were more males in the herpetic group (87.5%) than in the non-herpetic group (50%).

Figure I shows the frequency of ocular risk factors among 38 patients. Sixteen patients (42%) had no risk factor. Four risk factors were identified in 22 patients. Ocular trauma was the most common risk factor seen in 8/22, followed by use of traditional eye medicine 7/22 and previous viral disease 5/22. There were two patients who had a loss of corneal sensation.

Figure I: Ocular risk factors.



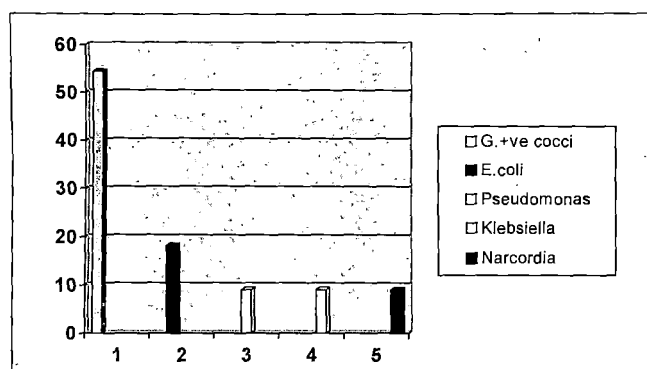
Clinical Presentation.

Most of the patients, 31 (81.6%) presented with more than one symptom. Pain was the most frequent symptom encountered in 29 patients followed by photophobia recorded in 28 patients. Poor vision and lacrimation was seen in 25 and 22 patients respectively. Pain and poor vision were more common in patients with non-herpetic ulcers, while lacrimation was frequent in patients with herpetic disease. Most of the ulcers were of medium, 17 (44.7%), and small sizes 12 (31.6%), but nine large ulcers were seen mainly in patients with non-herpetic disease. Visual acuity at presentation was poor in most of the patients. Twenty eight patients with non-herpetic ulcers presented with vision of 6/60 or worse whereas all patients with herpetic ulcers and two with non-herpetic ulcers had vision better than 6/60.

Laboratory Results.

The specimen samples of 30 patients were submitted for laboratory analysis. Specimens from nine patients were done at Parirenyatwa Hospital Laboratory and their results were negative on Gram stain and culture. Twenty one specimen samples were done at a private laboratory and in 11 (52.4%) of these, organisms were identified on smear and culture. Gram stain identified 4/11 of organisms and missed 5/11 organisms. Seven organisms were identified on culture medium including five in which Gram stain was negative and two previously identified on smears. No significant difference was found in terms of laboratory tests between Gram stain (n= 4/11) and culture (n=7/11) identification of organisms (or=0.27; 95% CI= 0.02 to 2.47; Fisher exact test 2-tailed p= 0.361). However, two specimens were identified on both the smear and culture. Gram positive cocci were the most common organisms identified accounting for 6/11. Most of these were *Staphylococcus epidermidis* (3/6), *Streptococcus* (2/6) and *Staphylococcus aureus* (1/6). *E. coli* accounted for 2/11 (18.2%) while *Pseudomonas*, *Klebsiella* and *Narcordia* accounted for one organism (9.1%) each.

Figure II: Percentage of different isolates identified by Gram stains and culture.

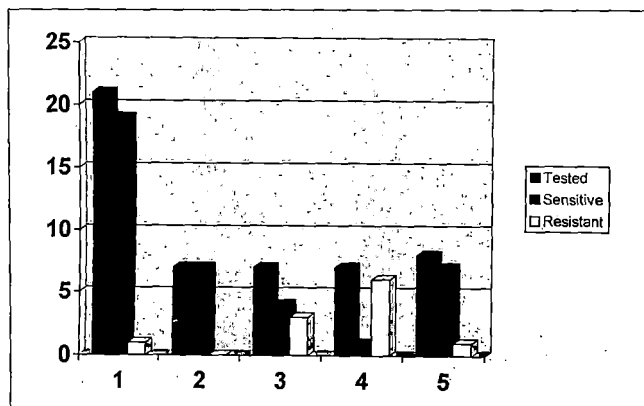


1- Gram positive cocci.; 2- E.coli.; 3- Pseudomonas.; 4- Klebsiella.; 5- Narcordia.

Sensitivity to Available Antibiotics.

Antibiotic sensitivity was tested against nine available antibiotics and sensitivity was calculated as the number of antibiotics to which an organism was sensitive out of the total number tested. In general, organisms were found to be sensitive to most of the antibiotics. Gram-positive cocci as a group were more sensitive to locally available antibiotics. *Pseudomonas*, however, showed marked resistance to all antibiotics except Gentamicin.

Figure III: Sensitivity to locally available antibiotics.



1- Staphylococcus epidermidis.; 2- Streptococcus pneumoniae.; 3- Non-Hemolytic streptococcus.; 4- Pseudomonas.; 5- Klebsiella.

Discussion

Corneal ulceration and subsequent scarring are serious causes of ocular morbidity and blindness in many developing countries. Management of corneal ulceration can be a challenging process in settings where no laboratory facilities exist to determine causative pathogens and influence choice of antibiotics. Two schools of thought have largely dominated the approach to management of corneal ulcers. One school⁷ contends that management of corneal ulceration should begin with laboratory identification of the causative organism on a corneal smear

followed by institution of antibiotic therapy based on the results of the Gram stain.

This approach assumes that laboratory facilities are available and within the reach of the treatment centre. This is, however, not the case in most developing countries where laboratory facilities are often non-existent or located at a considerable distance from district medical facilities. Most of the teaching and provincial hospitals may have basic facilities for the examination of corneal smears, thus enabling broad classification of organisms into Gram-positive or negative.

Two problems have become apparent in this regard, these are delays in making results available for immediate institution of therapy, as demonstrated in this study, and the reliability of Gram stain in positively identifying causative organisms on corneal smears which has been a subject of much controversy. Some studies,⁸ have found the Gram stain as a useful procedure, while others⁹ found positivity rates as low as 13 to 25%. This agrees with the findings of the current study.

In a review of the community care of corneal ulcers in the United States¹⁰ McDonnell and associates found that 48.9% of corneal ulcers were treated with antibiotics without prior corneal scrapings. However, 23% of clinicians thought that scrapings were necessary. In this study, 51.6% of patients had received empirical antibiotic therapy prior to presentation at Sekuru Kaguvi Hospital.

A recommendation concerning the use of corneal smears as a guide to initial therapy, although applicable in developed countries might not be readily applicable in developing countries. This is because laboratories for reliable identification of organisms are not always present and patients usually present late to hospital after trying traditional medicine which often modifies the clinical picture. Where laboratory facilities are available, the clinician's time and the expense involved in performing corneal scrapings may contribute to non-performance of the procedure. Using a hospital laboratory in our study, it often took 24 to 36 hours for scrapings to be tested due to shortage of technicians and lack of facilities to store culture plates over night in the eye unit. Another reason for physician reluctance to perform corneal scrapings may be that currently available antibiotics are effective, so that treatment failures are uncommon even when specific organisms are not identified. In a related study,¹⁰ McDonnell recorded a failure rate of only 10%. In this study over 80% of organisms tested were sensitive to available antibiotics and good clinical responses were observed.

The second school of thought¹¹ contends that initial therapy of suspected microbial ulcers could be started with broad-spectrum antibiotics known to be effective against the most prevalent organisms in the local community. This approach requires that the clinician is aware of studies documenting the type and distribution of pathogens in the local community and their sensitivity pattern to available antibiotics. In most parts of the developing world, but especially in Africa, such studies have not been done and

data is therefore scanty. Extrapolation of findings from studies conducted elsewhere must be done with caution as regional variations in organism prevalence have been recorded.³

This study aimed to provide information on the prevalence of different isolates in our locality. Fifty four percent of the isolates seen in our study were Gram-positive cocci and over 50% of these were *Staphylococci epidermidis*. The other 50% were made of equal numbers of *Staphylococcus aureus*, *Pneumococcus*, β -haemolytic *Streptococcus* and *Pseudomonas*. This distribution differs slightly from the findings of Carmichael *et al*² who found *Pneumococcus* to be the most common organism in their study. This is probably due to regional variation as noted earlier.³ Surprisingly enough, no fungal organisms were isolated in this study. This could be due to the fact that the laboratory technicians did not observe the samples for more than four days. *Nocardia*, thought to be a rare organism seen in immune-compromised patients, was isolated in one patient in this study.

This study is consistent with that of Hjortdal and Ewers¹² who found in their study that 25% of the patients had herpetic ulcers and these were mainly young males. The high incidence of herpetic ulcers in this age group may reflect the fact that this age group may be either at a greater risk of infections leading to reactivation of latent virus or HIV infections may be implicated as an underlying factor, since about one in five persons in Zimbabwe is HIV positive.¹³

Suppurative keratitis is often associated with ocular risk factors. Previous studies^{12,14} found ocular trauma as an important risk factor. This study confirms that ocular trauma was a common risk factor seen in 21.1% of our patients. Other risk factors were use of traditional eye medicine (TEM) and previous viral disease. Traditional medicine is an important component of health care in Zimbabwe. This is because most traditional healers are affordable, available and live within the community and patients often consult them before going to formal health institutions. The incidence of TEM use has been estimated to vary from 24 to 34% in this region.¹⁵ The impact of this practice on the prevalence of eye disease including corneal ulcers needs further evaluation.

Using corneal smears as the basis of starting initial therapy may not be appropriate in our setting as it has been shown in this and other studies, that corneal smears are not reliable in predicting the identity of the offending pathogens. Up to 45% of isolates were missed on smear in this study. A collateral finding of this study also shows that long delays in awaiting laboratory results may allow a patient's condition to deteriorate if treatment is not started immediately. The main finding of this study is that corneal ulceration is an important cause of ocular morbidity in our setting as shown by poor vision at presentation. Therapy should, therefore, begin immediately with a broad-spectrum antibiotic based on knowledge of the local population of pathogens and their sensitivity to available antibiotics.

Health education on the role of traditional medicine in the cause of suppurative corneal disease should be intensified and further studies undertaken to determine the prevalence and distribution of causative organisms in our locality. The main shortcoming of this study is a small sample size as no firm conclusion as to the prevalence of different isolates can be made. However, the study contributes to the body of knowledge about the causes of corneal ulcers and the role of the laboratory in their management in Zimbabwe.

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References

1. Kanski JJ. Clinical ophthalmology. A systematic approach. 3rd ed. Butterworth Heinemann 1994:104-7.
2. Camichael TR, Worterts M, Koornhoff HS: Corneal ulceration at urban African hospitals. *Br J Ophthalmol* 1985;69:920-26.
3. Asbell P, Starson S. Ulcerative keratitis, a survey of 30 years laboratory experience. *Arch Ophthalmol* 1982;100:77-80.
4. Neumann M, Sostrand J. Central microbial keratitis in Swedish city population. A three year prospective study in Gothenburg. *Acta Ophthalmologica* 1993;Apr;71(2):160-4.
5. Gordon J. Suppurative corneal ulcer. *Community Eye Health* 1988;2:1.
6. Mino de Casper H, Zoulek G, Paredes ME, Alborno R, Medina D, Centurino de Morinigo M, *et al*. Mycotic keratitis in Paraguay. *Mycoses* 1999;May-June 34(56):251-4.
7. Jones D B. Early diagnosis and therapy of bacterial corneal ulcer. *Into Ophthalmol Clin* 1973;13:1-29.
8. Kowal V O, Mead MD. Community acquired corneal ulcers. The impact of culture on management. ARVO abstracts supplement to Invest. *Ophthalmol* 1993;1210.
9. Maske R, Hill JC, Oliver SP. Management of bacterial corneal ulcer. *Br J Ophthalmol* 1986;70:199-201.
10. McDonnell PJ, Nobe J, Gauderman JW, Lee P, Alello A, Trousdale M. Community care of corneal ulcers. *Am J Ophthalmol* 1992;114(Nov):531-8.
11. Baum J L. Initial therapy of suspected microbial corneal ulcer — broad antibiotic therapy based on prevalence of organisms. *Surv Ophthalmol* 1979;24:97-105.

12. Hjortdal JO, Ewers N. Exogenic ocular and systemic factors associated with keratitic ulceration. *Acta Ophthalmologica* 1989(April);67(2):169-73.
13. *National HIV/AIDS policy Zimbabwe*. 1999 iv-v.
14. A L Samarra AR, Sumba MS. Bacterial corneal ulcer among Arabs in Kuwait. *Ophthalmic Res* 1989;21(3):278-84.
15. Courtright P, Lowallen S, Kanjalotis S, Divala DJ. Traditional eye medicine use among patients with corneal disease in rural Malawi. *Br J Ophthalmol* 1994;78:810-12.



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